Penny Packet

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May 29, 1996

Archivist
Archives
Sweet Briar College
Lynchburg, VA

Dear Sir or Madam (probably Madam),

In looking over old papers I came across some laboratory reports that my mother, Mary P. Davis, Sweet Briar, 1916, apparently made in a biology course. I thought they might be of interest to you. If not, please dispose of them as you wish. Perhaps somebody in the biology department might like to see them.

You need not acknowledge receipt of these reports, much less tell me what you have done with them.

My mother was the second of three sisters who graduated from Sweet Briar. She majored, I believe, in English literature and biology. After graduation she worked for a while as an assistant to a Philadelphia doctor who was writing a textbook on gastroenterology. Then she married and had three children. She died over a decade ago.

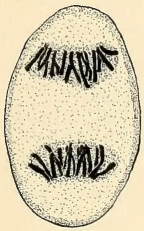
All the best.

Sincerely,

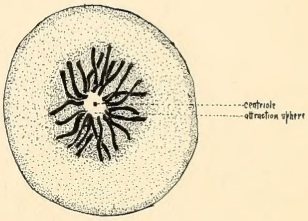
James Davis

James C. Davis

Mitotic Figures

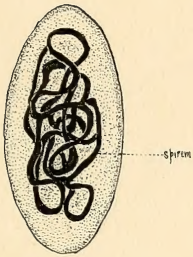


Anaphase

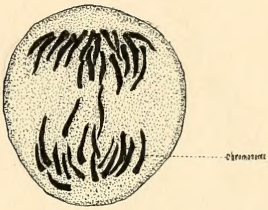


Telophase Viewed From One Pole

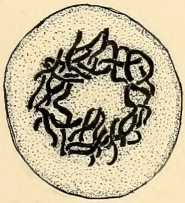
Mitotic Figures



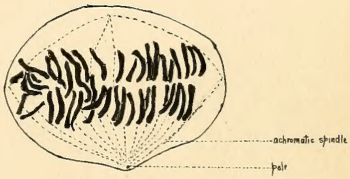
Prophase



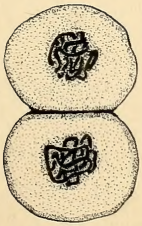
Late Metaphase.



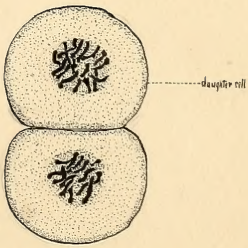
Metaphase



Early Metaphase



Late Telophase.



Reorganization

Endochondral Ossification

In Knee Joint of Kitten

I Epiphysis

II Blood Lake

III Cartilage Bone

IV Osteoclast

V Osteblast

VI Adipose Cells

VII Connective Tissue

VIII Patella

IX Muscle

X Nucleus of Muscle (Muscle Corpuscle)

XI Cartilage

XII Transverse Section of Muscle Showing Cohnheim's Areas

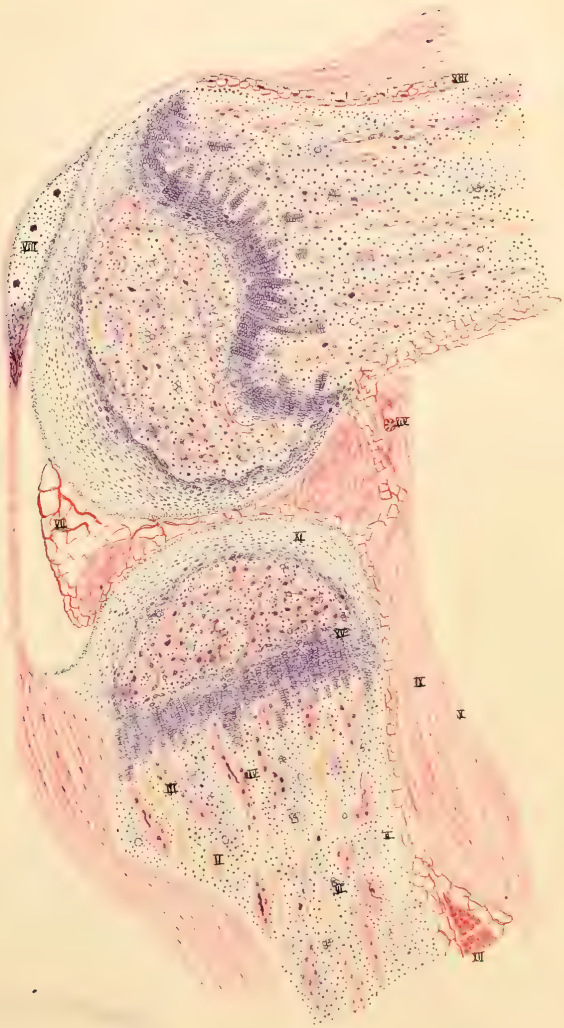
XIII Adipose Tissue With Nuclei

XIV Blood Vessel

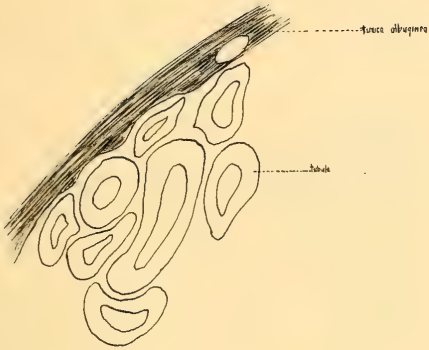
XV Cartilage Cells in Rows

Endochondral Ossification

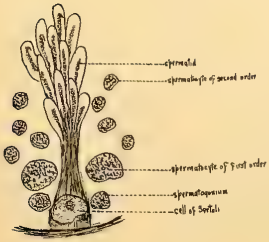
In Knee Joint of Kitten



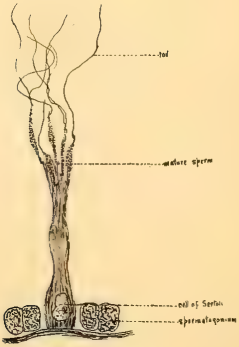
Testis



I

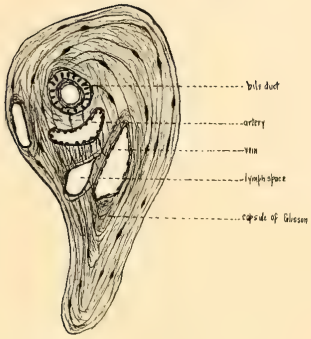


II

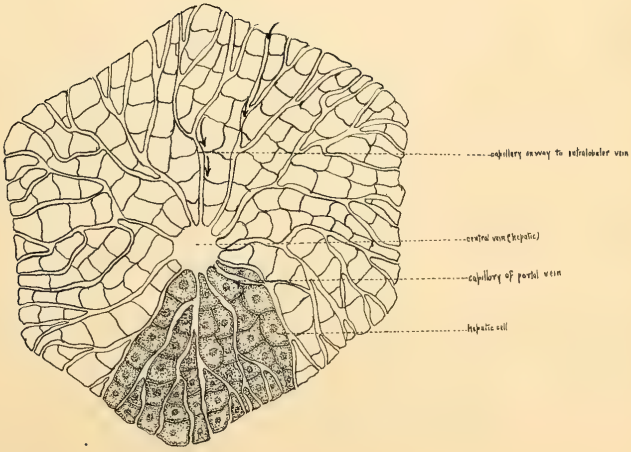


III

Liver

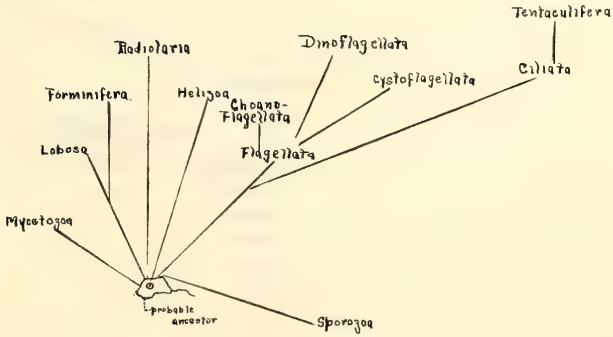


Portal Canal



Lobule of Liver

Mutual Relationships of the Chief Groups of Protozoa.



Phylum - Protozoa.

Class I Rhizopoda

Order 1. Lobosa

Amoeba

2. Forminifera

Miliola

Globegerina.

3. Heliozoa.

Actinophrys.

4. Radiolaria.

II Mycetozoa

III Sporozoa.

Monocystis agilis

Gregarinae

IV Mastigophora

Order 1. Flagellata.

Euglena.

Phacus

Peranema.

Volvox.

Gonium

Pandorina

Mastigamoeba

Dimorpha.

2. Choanoflagellata

Proterospongia

3. Dinoflagellata.

Ceratium

4. Cystoflagellata

Noctiluca.

V Infusoria.

Order 1. Ciliata.

Stentor.

Vorticella.

Colpoda

Pleurotricha.

Paramoecium

2. Tentaculifera.

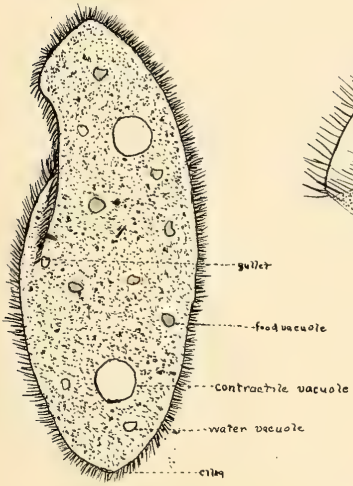
Podophrya

Genera seen

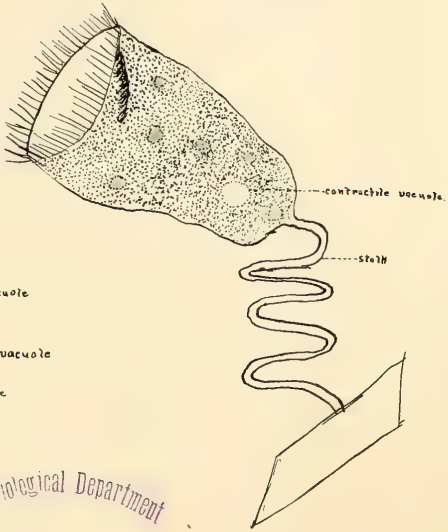
Genera not seen

Protozoa Infusoria Ciliata.

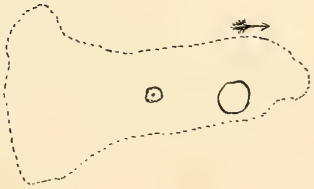
Colpoda.



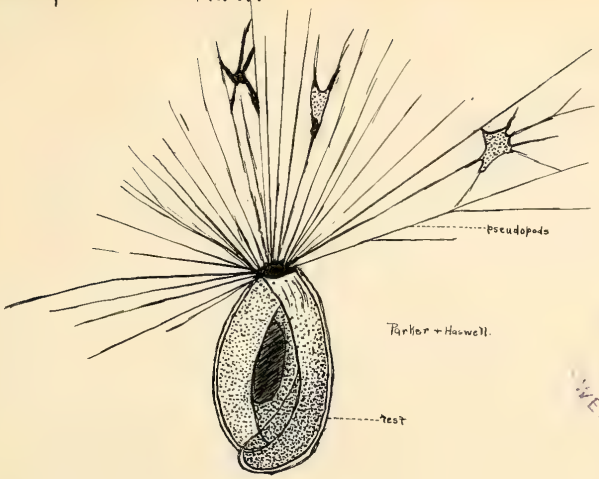
Vorticella.



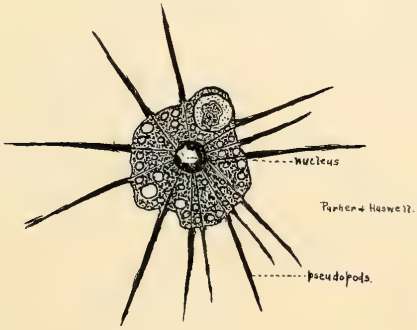
Rhizopoda Lobosa: Amoeba



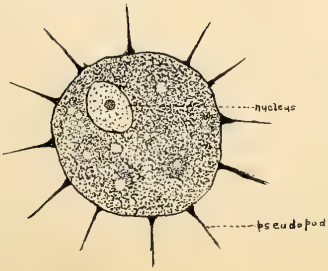
Rhizopoda Foraminifera Miliola



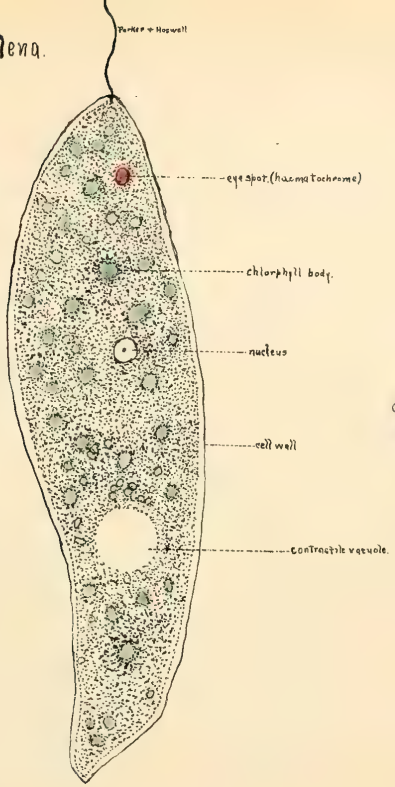
Heliozoa Actinophrys sol.



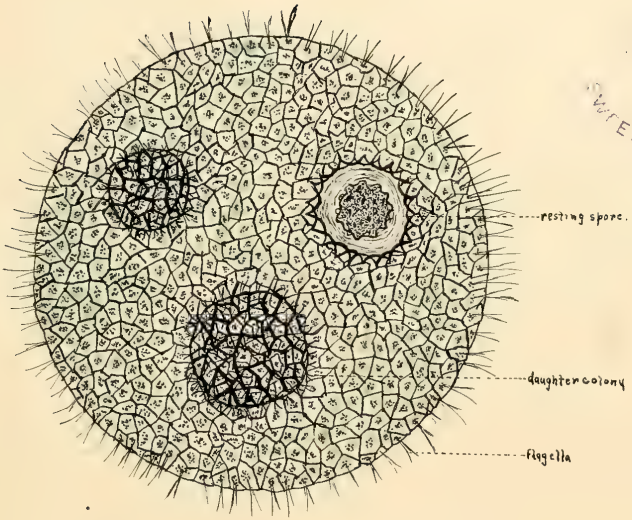
Heliozoa Actinophrys.



Mastigophora Flagellata Euglena.



Mastigophora. Flagellata Volvox.



Phylum Porifera.

Class Porifera

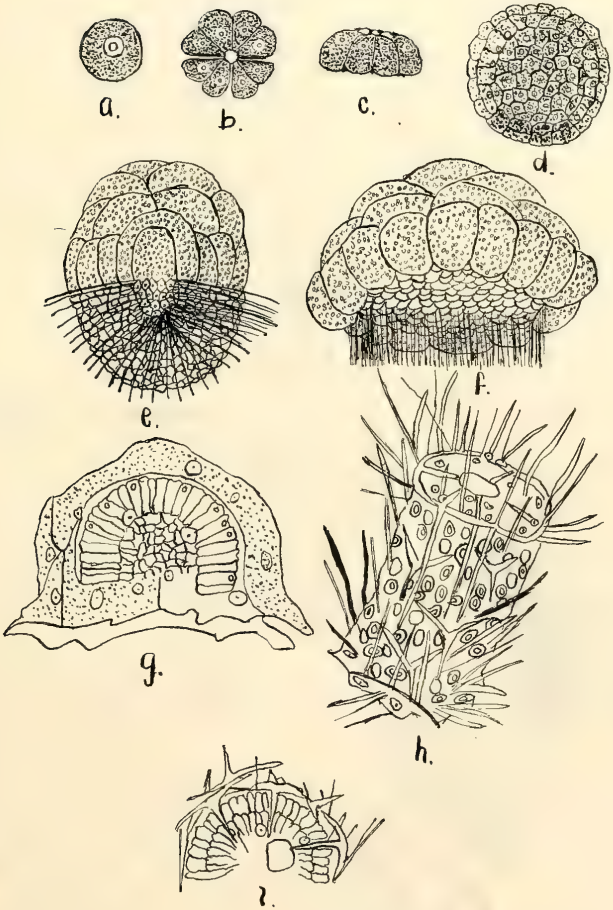
Order Ascon

Leucoselenia.

Sycon

Grantia

Development of the Sycon Sponge.

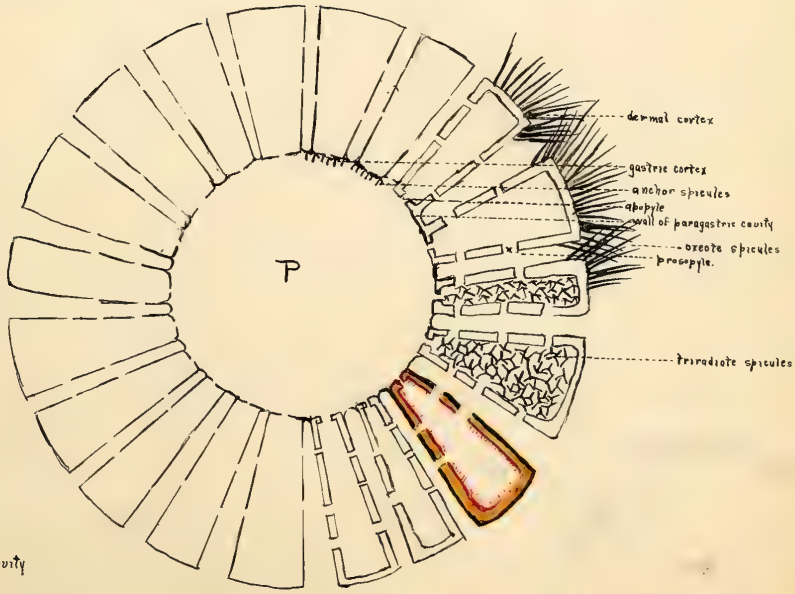


Parker and Haswell.

Porifera. Ascon. Leucosolenia.

Colony.

Sycon Grantia



P.....paragastric cavity
.....entoderm
.....mesoglea
.....ectoderm.

Phylum Coelenterata

Class Hydrozoa

Order Leptolinae

Anthomedusae

Parypha

Scyphozoa

Aurelia (Scyphula) (Ephyrula)

Actinozoa

Metridium.

Ctenophora

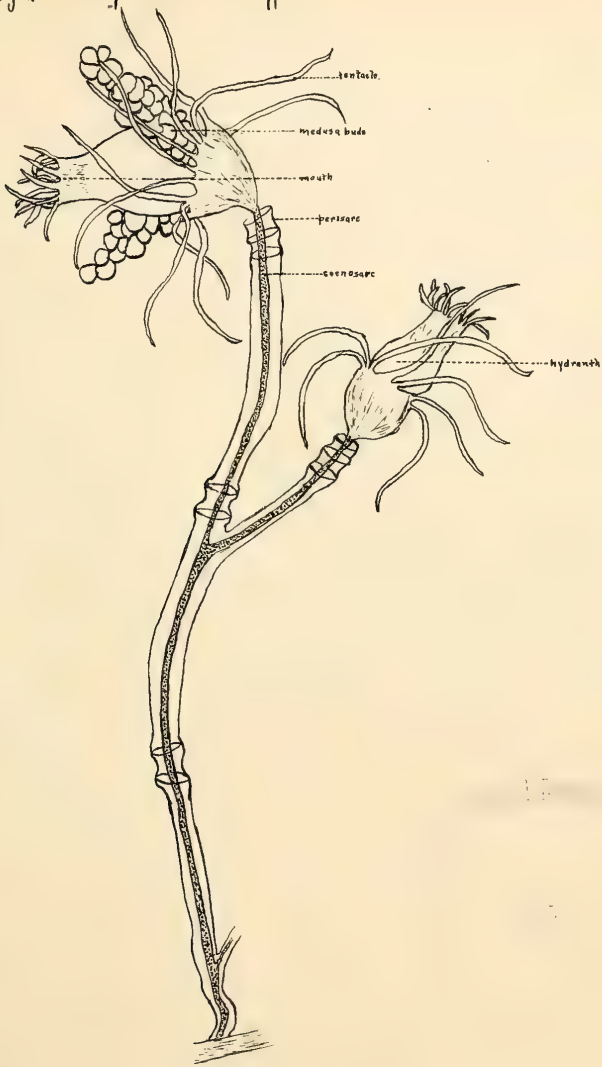
Pleurobrachia.

Coelenterata.

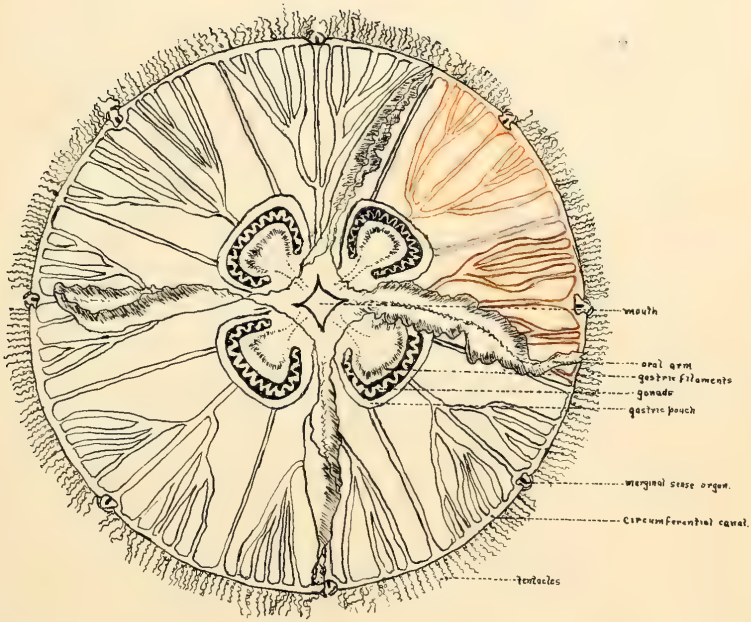
Alternation of Generations.

	Asexual					Sexual		
Pennaria.	Fertilized egg	Free swimming planula.	colony	hydranth	medusa bud.	♀ and ♂ medusae	eggs sperms	Fertilized egg.
Obelia	Fertilized egg.	Free swimming planula	colony	Gonangium. and Hydranth	medusa bud.	♀ and ♂ medusae.	eggs sperms	Fertilized egg.
Aurelia.	Fertilized egg	Planula develops into scyphula.	scyphula develops into ephyrulae	ephyrulae	single ephyrula	♀ or ♂ medusae	eggs sperms	Fertilized egg
Parypha.	Fertilized egg.	Planula develops into hydrula	colony	hydranth	medusa bud in clusters	♀ and ♂ medusae	eggs sperms	Fertilized egg. fertilization takes place on colony.

Coelenterata. Hydrozoa Leptolinae Parypha.



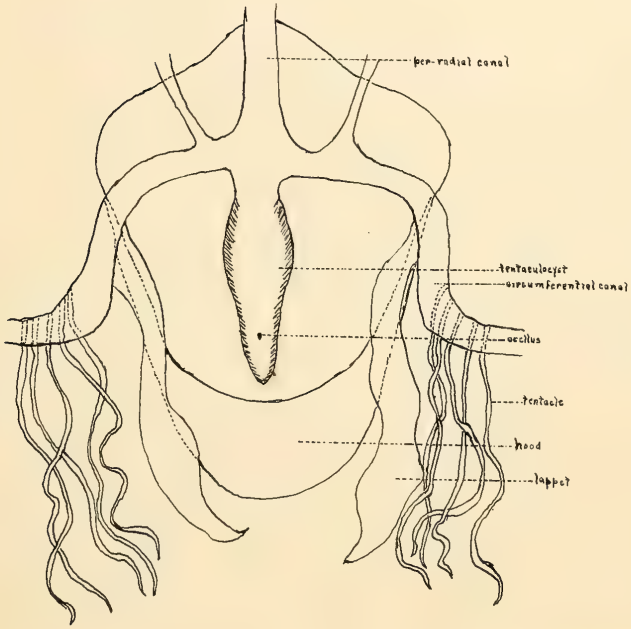
Coelenterata. Scyphozoa. Aurelia.



inter-radial canal
ad-radial canal
per-radial canal

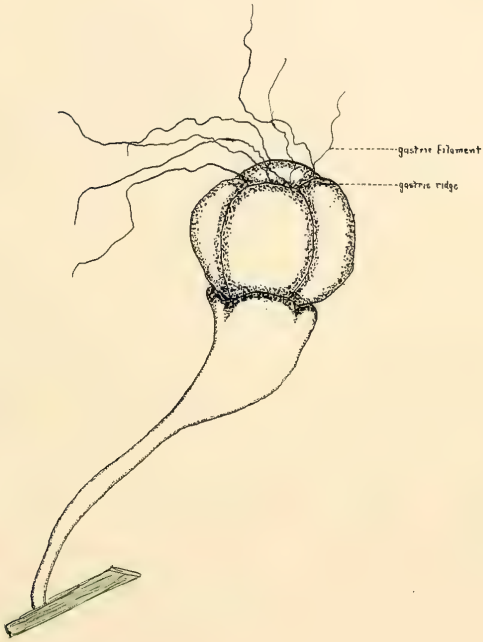
Marginal Sense Organ of Aurelia.

View of Oral Surface.

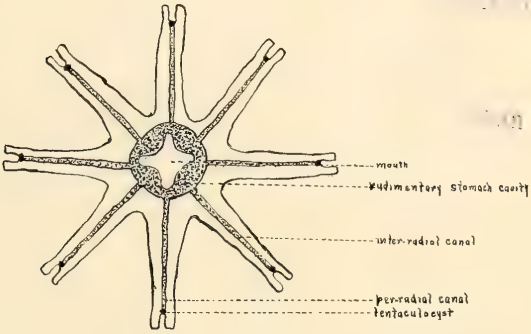


x section Aurelia thru two stomach pouches

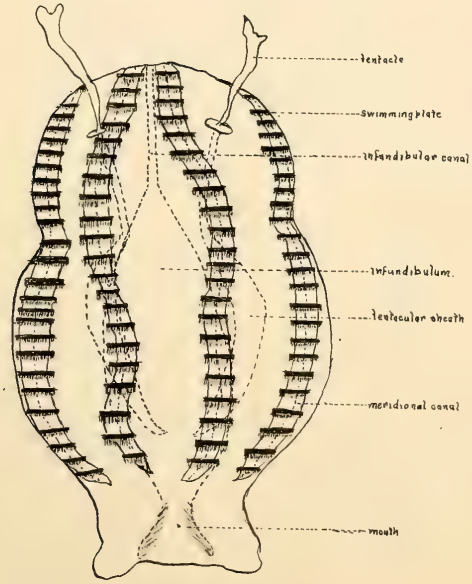
Coelenterata Scyphozoa Scyphula of Aurelia.



Coelenterata Scyphozoa Ephyrula of Aurelia.



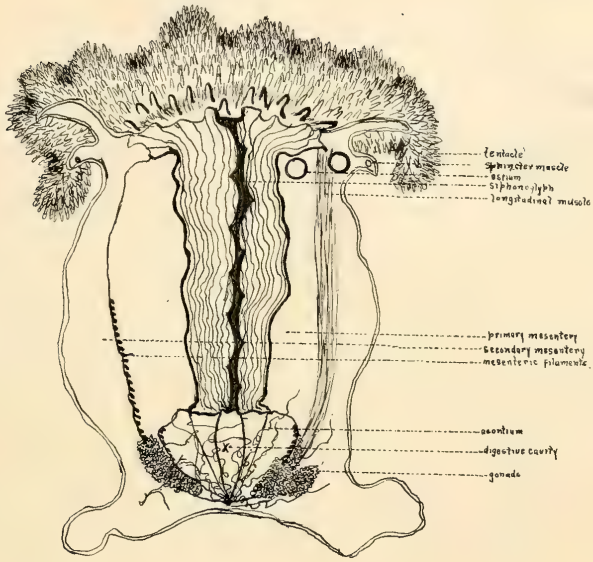
Ctenophora Pleurobrachia (Sea Walnut).



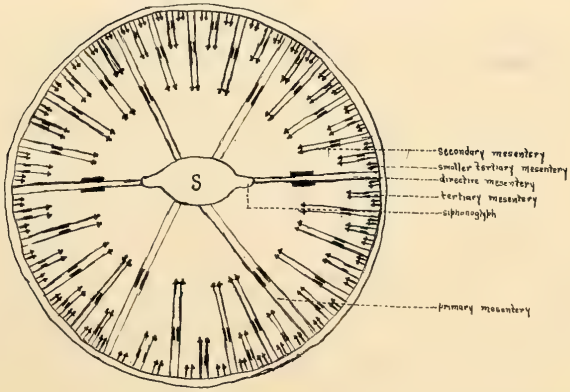
Coelenterata Actinizoa Metridium.

Coelenterata Actinozoa Metridium

Longitudinal Section



Transverse Section



S--------stomodeum.

Phylum Platyhelminthes.

Class Turbellaria

Order Tricladida

Planaria

Cestoda

Crossobothrium laciniatum

Scolex polymorphus.

Trematoda

Distomum hepaticum

Liver Fluke (Distomum hepaticum).

The phylum Platyhelminthes or Flat Worms are a group of soft bodied bilateral, usually flattened animals, with a great range of complexity. The body is built up of three embryonic layers — ectoderm, entoderm, and mesoderm. Nearly all the members of the phylum have an excretory vascular system of a peculiar kind, the water vascular or protonephridial system. There is no body cavity, the spaces between the organs being filled up with a peculiar kind of connective tissue called parenchyma.

The Trematoda, the Class to which the Liver Fluke belongs, are exclusively parasitic. For adhesion to the host they are armed with hooks and suckers, structures derived from the skin.

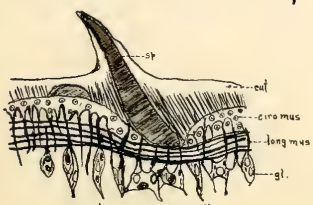
Several results of parasitism are found in this class. Among them are the weak development of sense organs and brain, a tendency to the development of accessory ganglia near the adhesion organs, and the great development of sexual organs, which at maturity fill a great part of the body.

One of the two great orders under Trematoda is Distomae, which includes forms entirely entoparasitic. To this order belongs the Liver Fluke or Distomum hepaticum.

The Liver Fluke of Sheep is usually found in the interior of the larger bile ducts of the infested animal, where it stops up the duct and causes a disease known as "liver rot". It is a soft bodied worm of flattened leaf like shape, or somewhat the size and shape of a pumpkin seed. The head lobe is a triangular shaped process, which projects from the broader end of the body. The parts are distinctly bilaterally symmetrical, and externally, the body is equilateral but this symmetry does not extend to all of the internal organs.

Fig I.

The surface of the liver fluke is devoid of cilia, but the whole body is covered with minute spinules or papillae which are prolongations of the cuticle, or external layer. The mouth (mo) surrounded by a muscular oral sucker is a small opening at the extreme anterior end of the triangular head lobe. A short distance back on the ventral surface, just behind the head lobe is a second much larger posterior sucker (schr). Between the two suckers, nearer the posterior one is a median aperture, the genital opening (cirr), thru which may be protruded a curved muscular organ, the cirrus or penis. A minute opening, the excretory pore (excr), may be found in the middle of the posterior end of the body.



X section of body wall

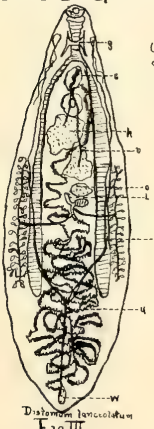
Fig II

The body wall comprises three layers, (1) the homogeneous cuticle (cut) of which the spinules (sp) are special developments, (2) a layer of circularly disposed muscular fibres (circ mus), (3) a layer of longitudinal muscle fibres (long mus). Numerous unicellular glands (gl), the ducts of which open to the outer surface, are found beneath the muscles. Internally, a peculiar form of connective tissue, the parenchyma, fills the interspaces between the organs.

The mouth leads to a small rounded bulb like body, the pharynx, which is a small cavity with thick muscular walls. From this a short passage, the oesophagus, leads to the intestine. Owing

to its being filled with filled with dark bilary matter, mixed with blood, on which the fluke feeds, this organ is a conspicuous one. It divides almost immediately into two main limbs, right and left, from which are given off, internally and externally, a number of blind branches. The whole intestine forms a very complex system extending throughout the body. There is no aperture of communication between the intestine and the exterior, the only exterior opening of the alimentary system being the mouth. A branching system of vessels, the water vessels, or vessels of the excretory system, ramify throughout the body.

The excretory system consists of a longitudinal main trunk which opens at the excretory pore (w) at the posterior end of the body. It gives off four large trunks in front. These branch repeatedly until a system of extremely fine microscopic vessels or capillaries is formed. Each of these ends, internally, in a slight enlargement, situated in the interior of a large cell, an excretory or flame cell.



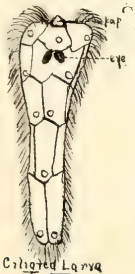
Distomum lanceolatum
Fig III

The nervous system of the Liver Fluke consists of a ring of nerve matter around the oesophagus. It has two lateral thickenings of glands, the ganglia (g) containing nerve cells and a single ganglion in the middle line below. From these lead a number of nerves, the chief of which are a pair of lateral cords which run to the posterior end, and give off numerous branches. There are no special organs of sense.

In this form both male and female organs of reproduction are found on the same individual. The male apparatus consists of the testes (h), two vasa deferentia (v) and the cirrus (c). The testes are two very much branched tubes, in the middle part of the body, one behind the other. A vasa deferens runs forward from each testes, and the two meet anteriorly in a long sac, the vesicula seminalis, from which the ejaculatory tube leads to the extremity of the cirrus, the male aperture.

The female organs consist of a single ovary (o), or germarium, an oviduct, a uterus (w), an ootype, vitelline glands (i) and shell glands. The ovary, a body which looks very much like one of the testes, lies on the right hand side, in front of the testes. The branches open into a common tube, the oviduct. The vitelline glands are made up of a great number of minute round follicles, which take up a considerable space on each side of the body. On each side there are two large ducts, anterior and posterior, which join to form a main lateral duct on each side. These run in and open into a single yolk sac. From this the single vitelline duct runs a short distance and meets the oviduct. Around the place where they meet are the shell glands, each of which opens into the oviduct. The union of these two ducts forms the uterus, which is a long, very much convoluted tube. The first part of this tube is called the ootype, for here the egg and yolk cells are formed into the egg, and it is enclosed in a shell. The uterus opens in front close to the base of the cirrus. The canal of Laurer (l) leads from the junction of the oviduct and median vitelline duct to open outside on the dorsal surface.

The ovum, as soon as it is fertilized, becomes surrounded by a mass of vitelline or yolk substance. Then when it passes through the vitypa it becomes enclosed in chitinous matter which is secreted by the shell glands. The egg, in this condition, remains in the uterus, and finally is discharged and passes down the bile duct of the Sheep to the exterior. It is not until this stage that active development begins. After three or six weeks, the part of the shell drops off at one end and the embryo is freed. This embryo or miracidium is a small cone shaped body covered all over with vibratile cilia. It has two eye spots (eye) near the broad anterior end, and has a triangular head lobe (hp). It has an imperfectly developed intestine a pair of flame cells, each with a minute opening on the surface, and the rest of the inside is filled with a mass of germ cells. This larva swims about in the water, or moves over the damp ground for a time by means of its cilia, and dies unless it is able to find a Pond Snail, on which it may become parasitic, for it is on the snail only, that it can develop into the next stage. It usually rests in the pulmonary sac, or some other organ of the Snail. When it is settled in the interior it loses its ectoderm, and rapidly grows into the Sporocyst, which is an elongated sac with an internal cavity containing germ cells and lined with a layer of cells with remnants of eye spots (eye), and with flame cells. The sporocyst may divide by transverse fission, but this it does only rarely. The germ cells in the internal cavity of the sporocyst bud off into cells which develop into a stage very much like a gastrula (gast) These elongate and develop into a body known as redia, which finally force their way out of the sporocyst and settle usually in the liver of the Snail



Ciliated Larva
Fig IV.

Fig V
Sporocyst

Fig VI
Redia

When fully developed, the redia is a long rounded body with a pair of short processes (proc) and a ridge (rid) running around the body at the anterior end. It has a mouth which leads to a

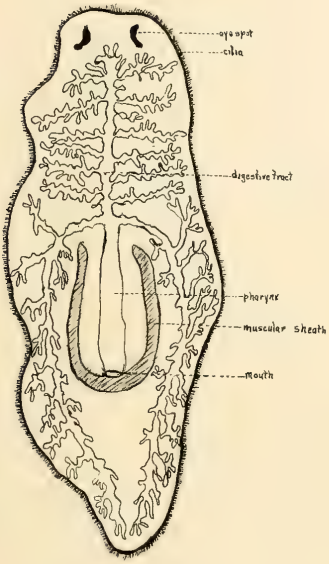
pharynx, and this leads to a sac like intestine. There is no excretory system. The redia has two possibilities, depending on the time of the year. It gives off, in the interior, cells which develop very much as the gastrula in the sporocyst. If it is winter these develop into new rediae and increase the number, so that there is a greater chance that some may live to undergo the next stage in their history.

It is, of course, necessary in a form which is dependent on another form to continue its life, that there should be a system by which many larvae may develop from one egg. There is every chance that if the proper conditions do not present themselves, that all of the rediae may perish.

Fig VII
Cercaria

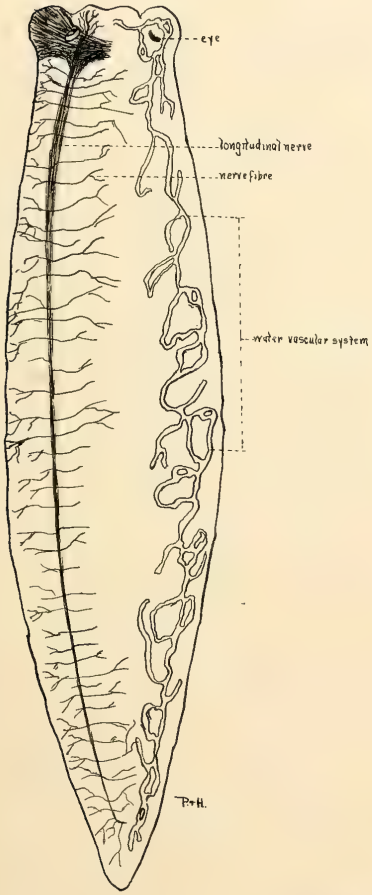
If it is summer, these gastrulae develop into 'cercariae', which have long tails, anterior (or su) and posterior (vent su) suckers, a mouth, a pharynx and an oesophagus (oes), leading into a bifid intestine (int). The 'cercaria' escapes through a birth opening (b op) Pages in the wall of the redia near the circular ridge. The cercaria moves by means of its tail and forces its way out of the Snail. It then loses its tail and becomes encysted and attached on a blade of grass or herbage of some kind. The next stage of the Liver Fluke is dependent upon its final host, the Sheep. If the Sheep swallows the grass on which it is encysted it can reach its mature stage by losing its cyst and forcing its way up the bile duct to the liver, where it rapidly develops, and attains its adult condition.

Platyhelminthes Turbellaria Planaria.

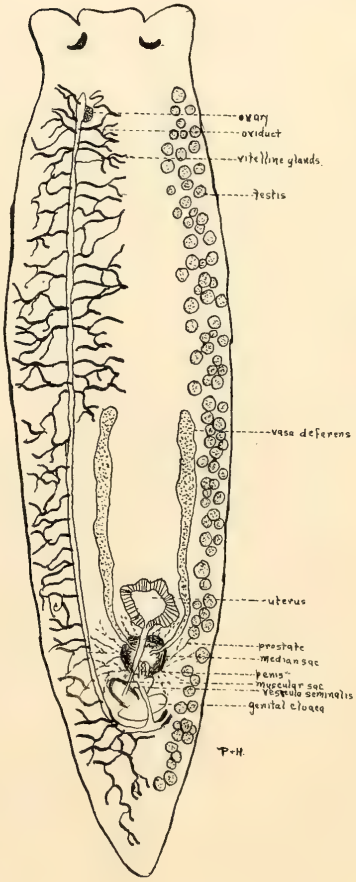


Platyhelminthes Turbellaria Planaria.

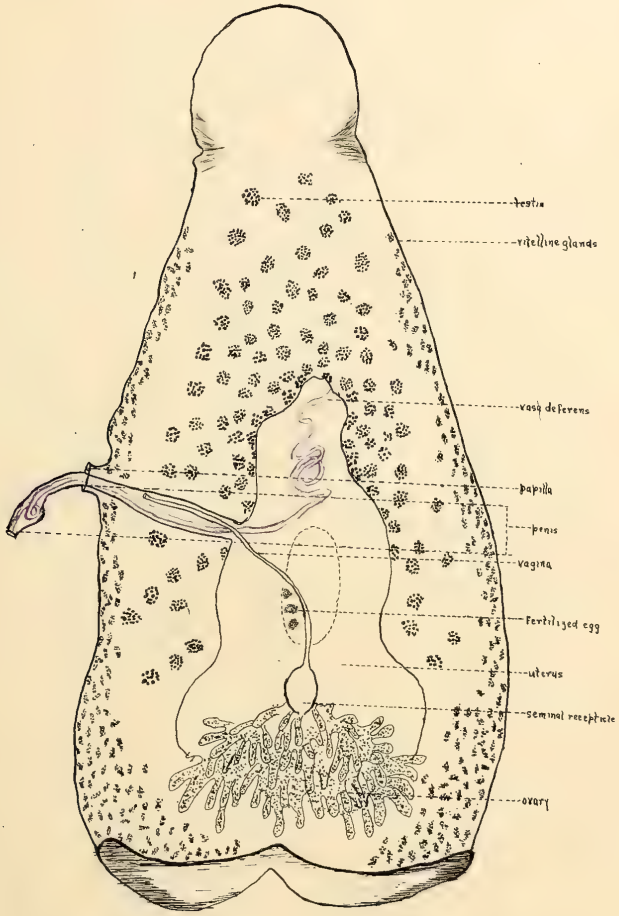
Nervous and Water Vascular Systems



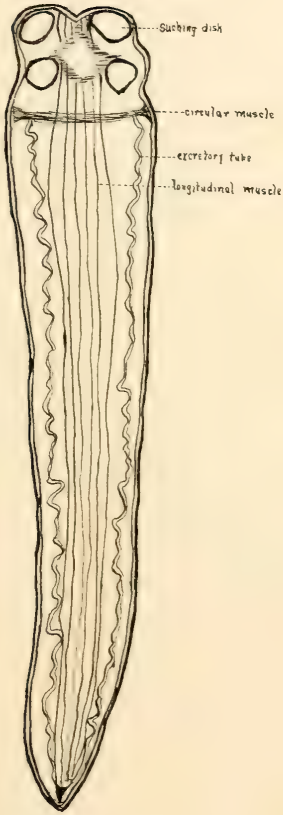
Reproductive System.



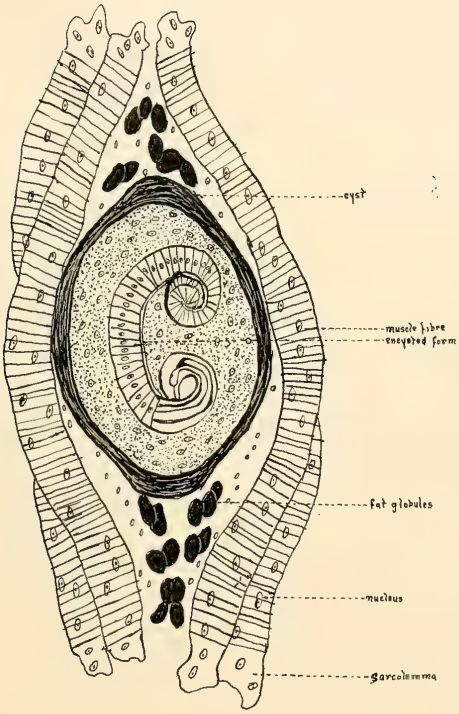
Platyhelminthes Cestoda Crossobothrium laciniatum.



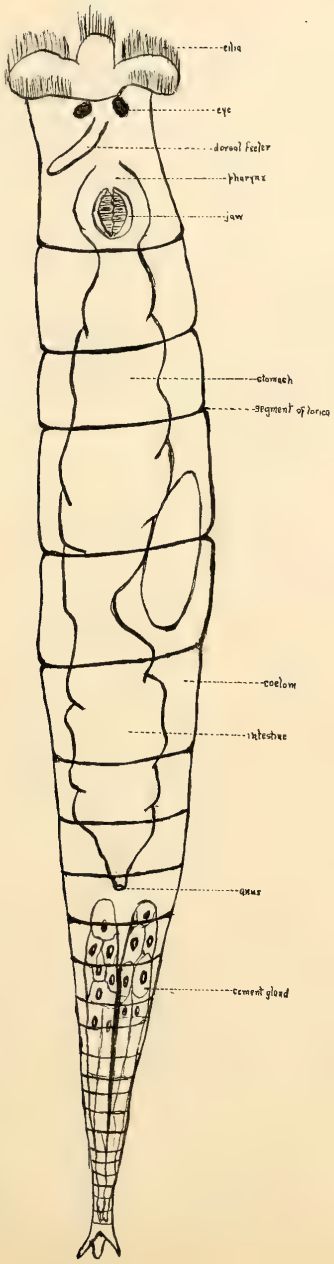
Plathelminthes Cestoda Crossobothrium laciniatum Scolex polymorphus



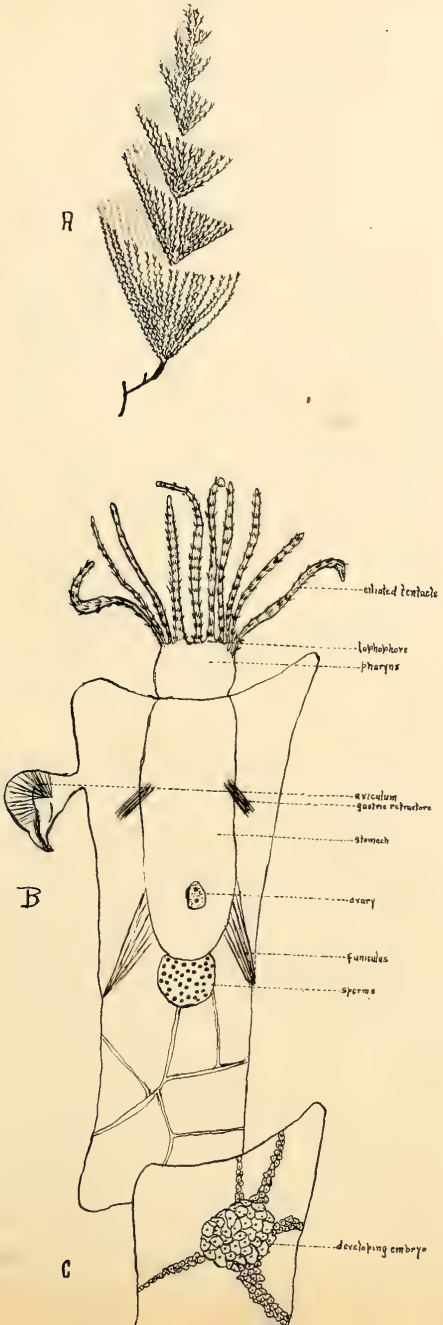
Nemathelminthes Trichina spiralis



Trochelminthes Rotifera



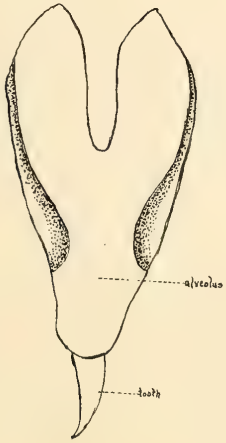
Molluscoida Polyzoa Bugula avicularia.

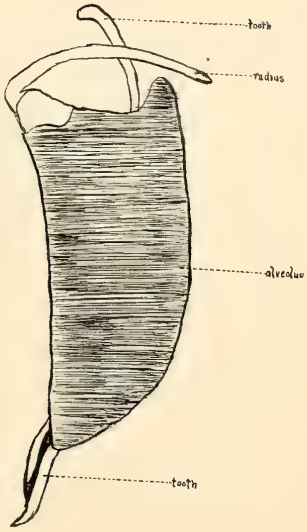


A---Habitat
B---Zooecium
C---Ooecium

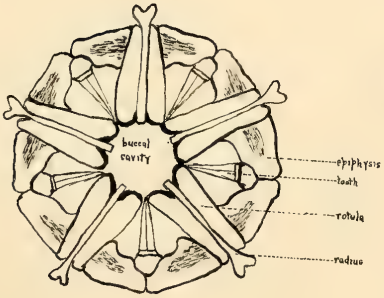
Echinodermata Echinoidea Aristotle's lantern

1. Arbacia



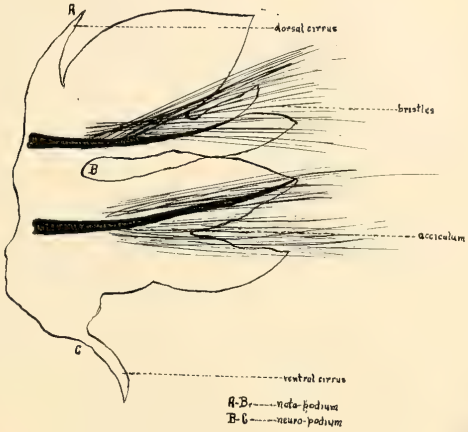


2. Strongylocentrotus.

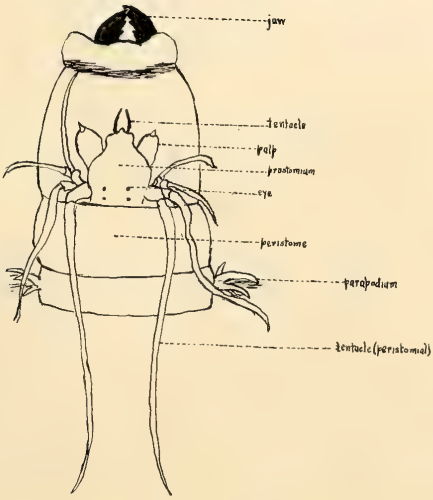


Annulata Chaetopoda Polychaeta Errantia Nereis

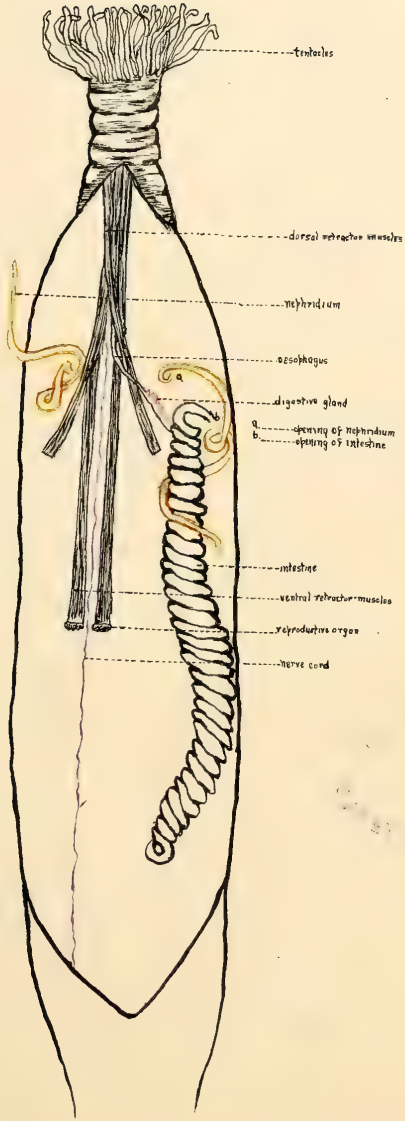
Parapodium



Head of Nereis



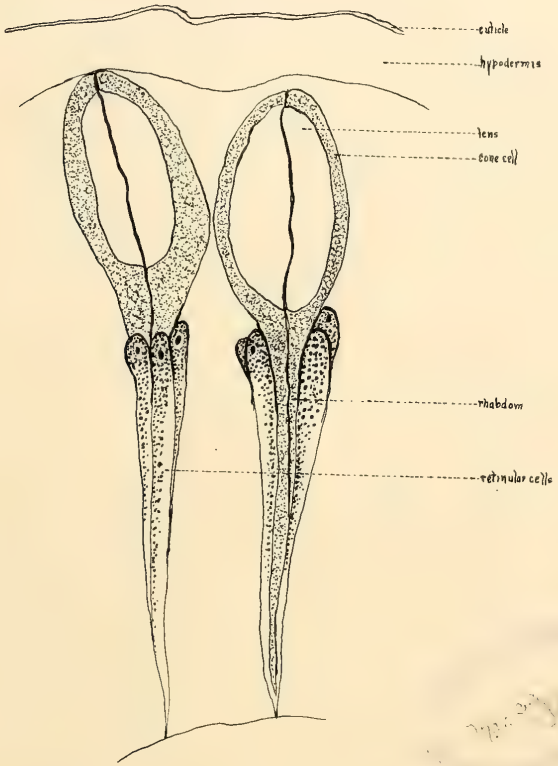
Annulata Gephyrea Sipunculus



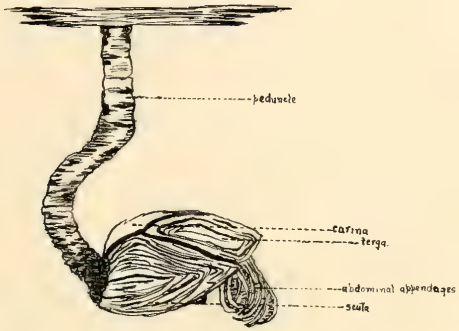
Annulata Hirudinea Hirudo

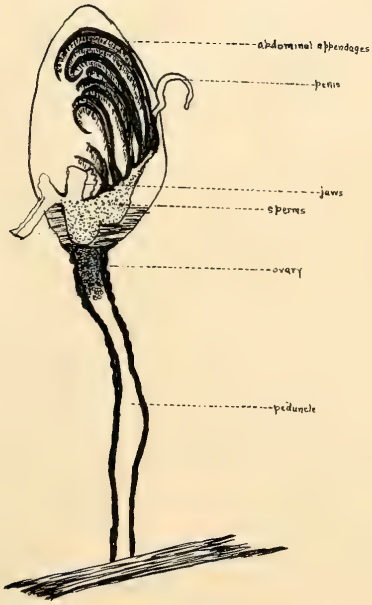
Arthropoda Crustacea Entomostraca Phillopoda Euphillopoda Branchipus.

Ommatidia



Arthropoda Crustacea Entomostraca Cirripedia Lepas



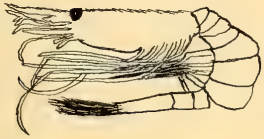


Arthropoda

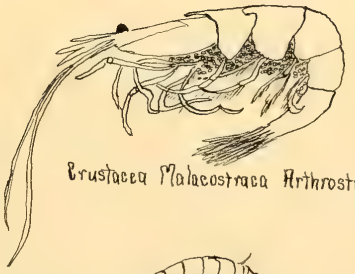
Crustacea Malacostraca Arthrostraca Caprella.

Crustacea Malacostraca Arthrostraca Orchestia

Crustacea Malacostraca Decapoda Macrura Palaemon.



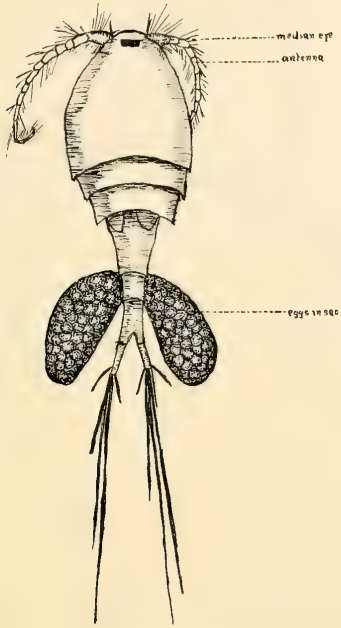
Crustacea Malacostraca Decapoda Macrura Crangon.



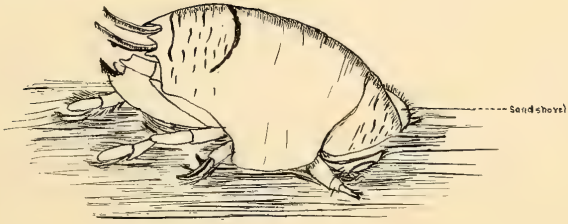
Crustacea Entomostraca Phillopoda Branchipus

Crustacea Malacostraca Arthrostraca Gammarus.

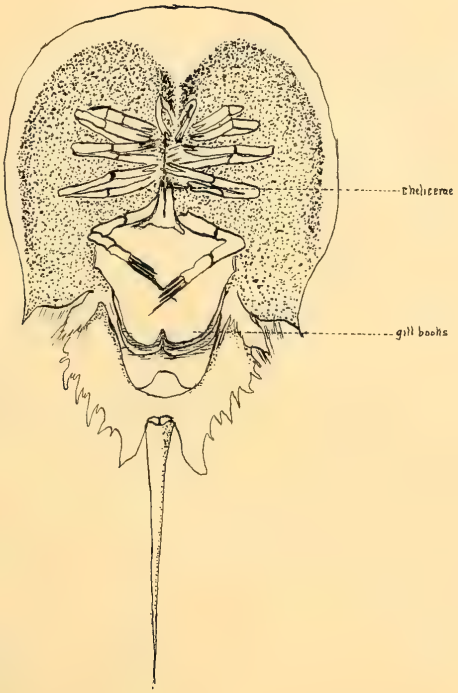
Arthropoda Crustacea Entomostraca Copepoda Cyclops



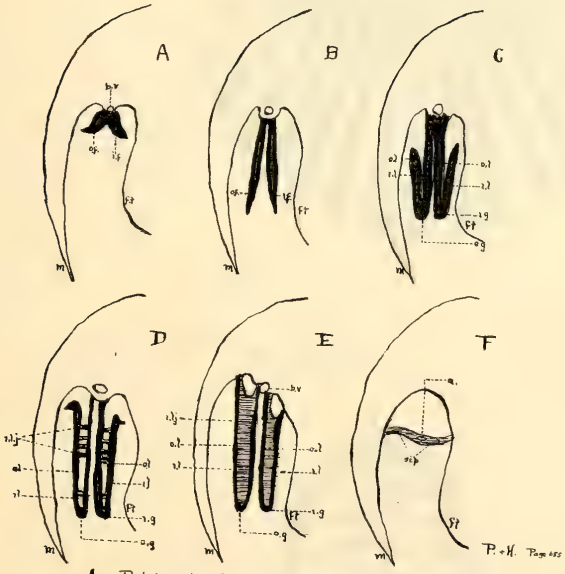
Malacostraca Macrura Hippa.



Arthropoda Arachnida Limulus

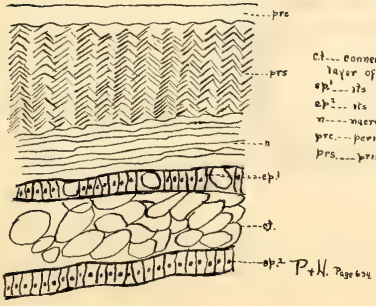


Diagrams Showing Probable Evolution of the Complex Gill of Lamellibranchiata

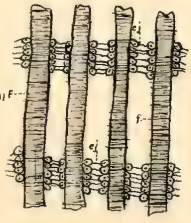


a--- aperture in branchial septum
b.v.---blood vessel
ft.---foot
i.f.---inner row of filaments
i.g.---inner lamina
i.l.---inner lamella
i.l.j.---interlamellar junctions
m.---mantle
o.f.---outer row of filaments
o.g.---outer lamina
o.l.---outer lamella
sep.---branchial septum

A.....Protobranch C.....Filibranch E.....Filibranch
B---Protobranch D.....Filibranch F.....Septibranch.

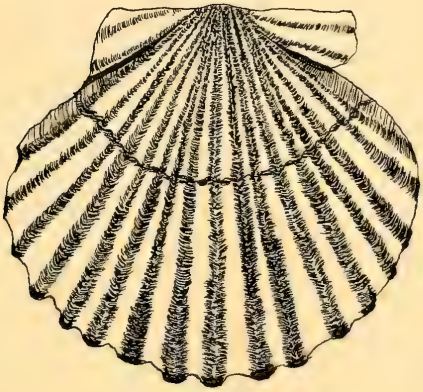


ct.---connective tissue layer of mantle
ep.1---its outer epithelium
ep.2---its inner epithelium
n---nacreous layer of shell
prc.---periostracum
prs.---prismatic layer.

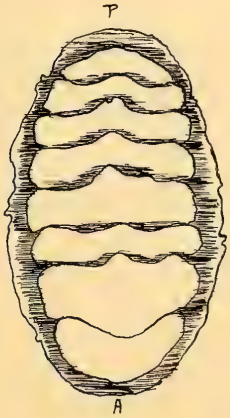


c.j---ciliary junction
f---filaments

Mollusca Lamellibranchiata Pseudobranchia Pecten (shell)

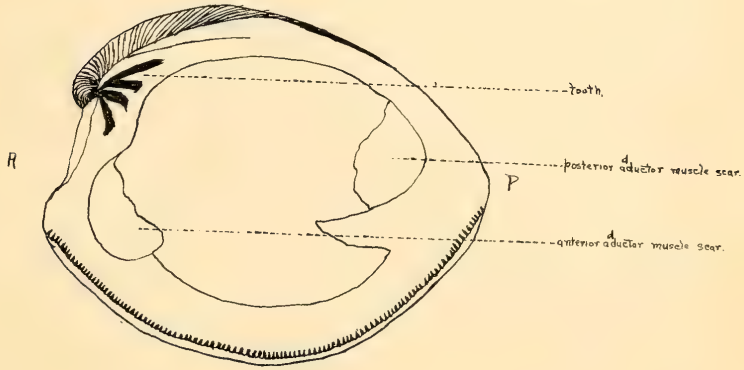


Amphineura Chiton (shell)

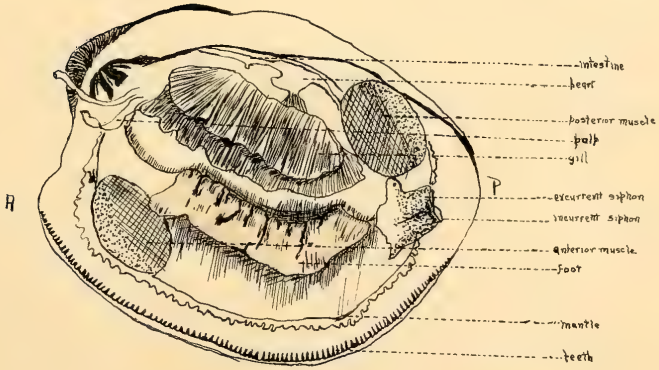


Mollusca Lamellibranchiata Eulamellibranchia Clam

Inner Surface of Left Valve

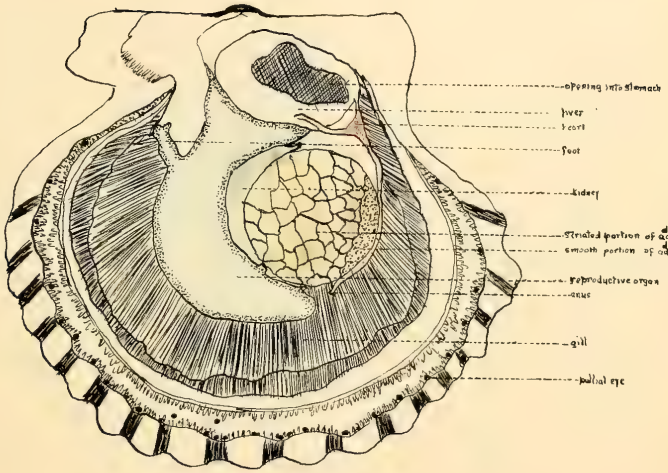


Internal Anatomy.

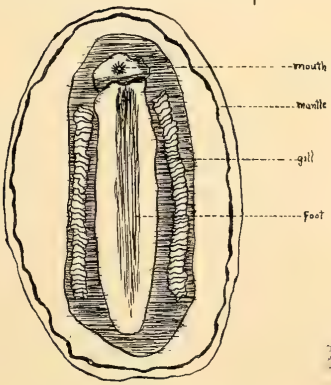


Mollusca Lamellobranchiata Pseudolamellobranchia Pecten.

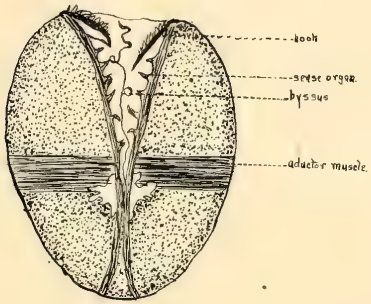
Internal Anatomy



Amphineura Chiton. Internal Anatomy

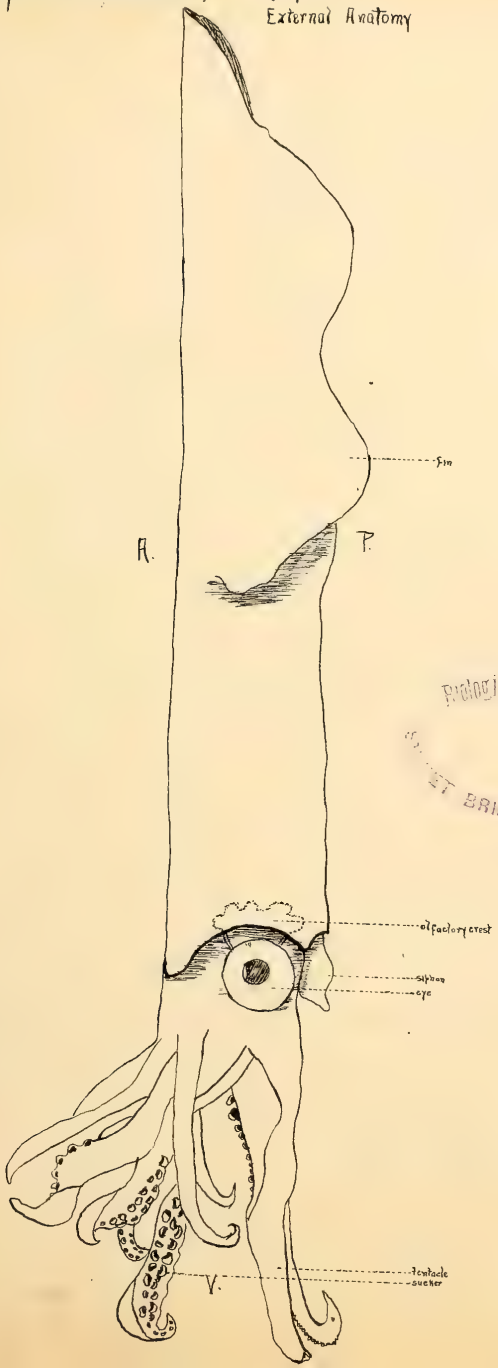


Mollusca Lamellibranchiata Glochidium.



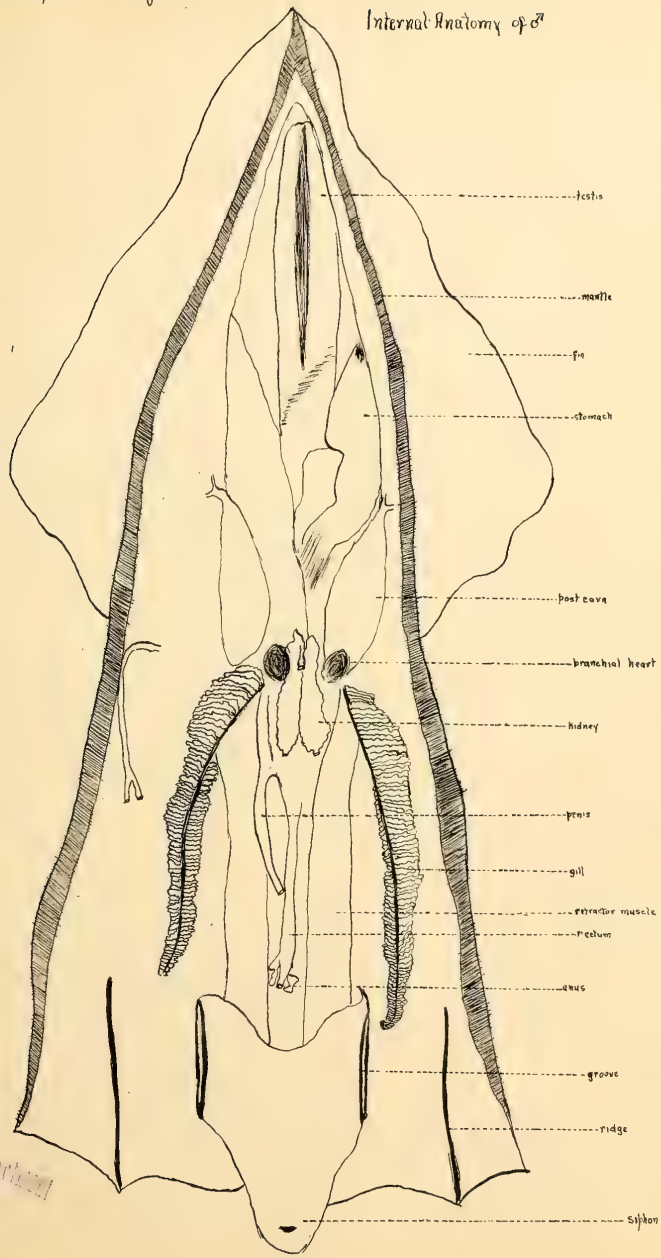
Mollusca Cephalopoda Diobranchiata D. Loligo pealii

External Anatomy



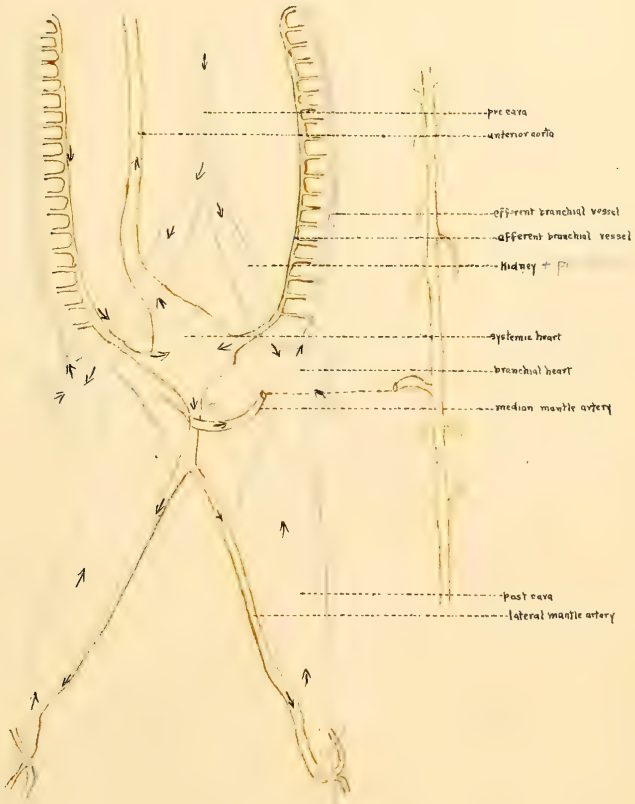
Mollusca Cephalopoda Squid

Internal Anatomy of ♂



Mollusca Cephalopoda Squid.

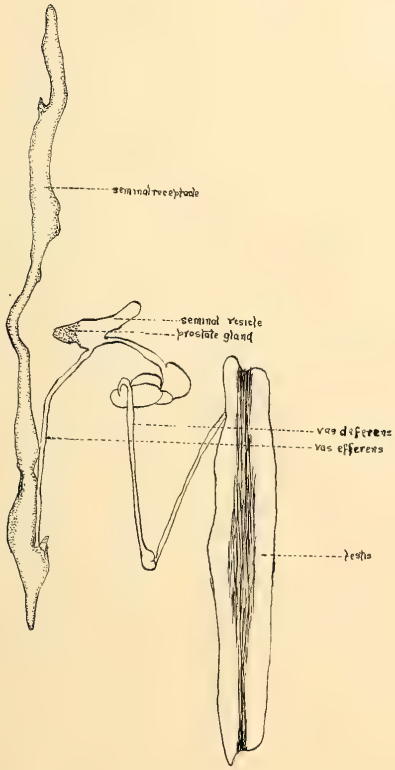
Circulatory System.



arterial system
venous system

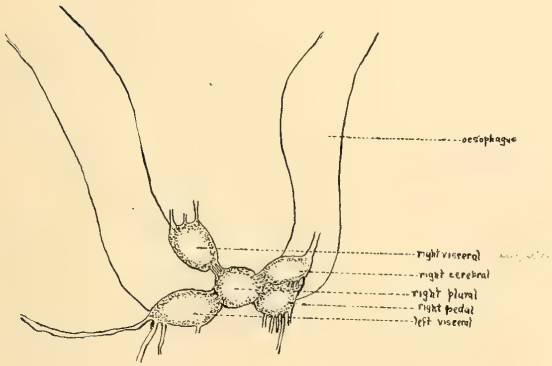
Mollusca Cephalopoda Squid

Reproductive System of ♂



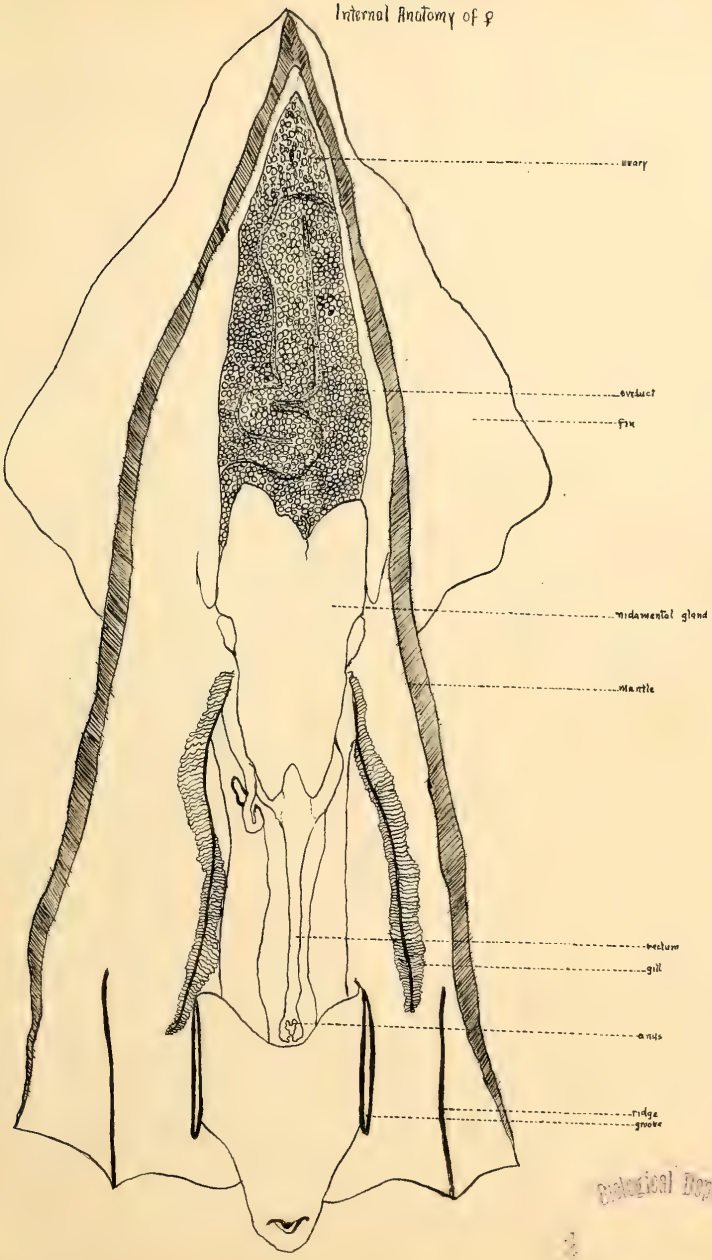
Mollusca Gastropoda Sycotopus

Nervous System (Right Side)



Mollusca Cephalopoda Squid.

Internal Anatomy of ♀



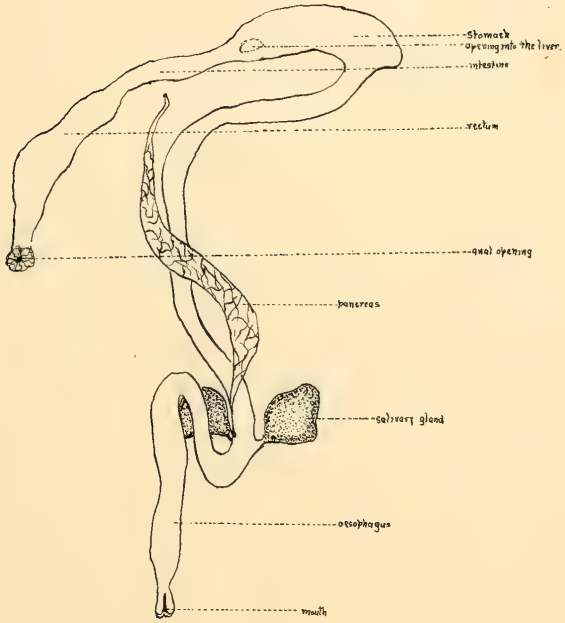
Mollusca Gastropoda Sycotopus.

Mollusa Gastropoda Sycotopus

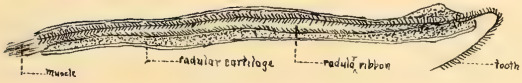
Diagram Showing Mantle Cavity

Mollusca Gastropoda Sycotopus

Digestive System

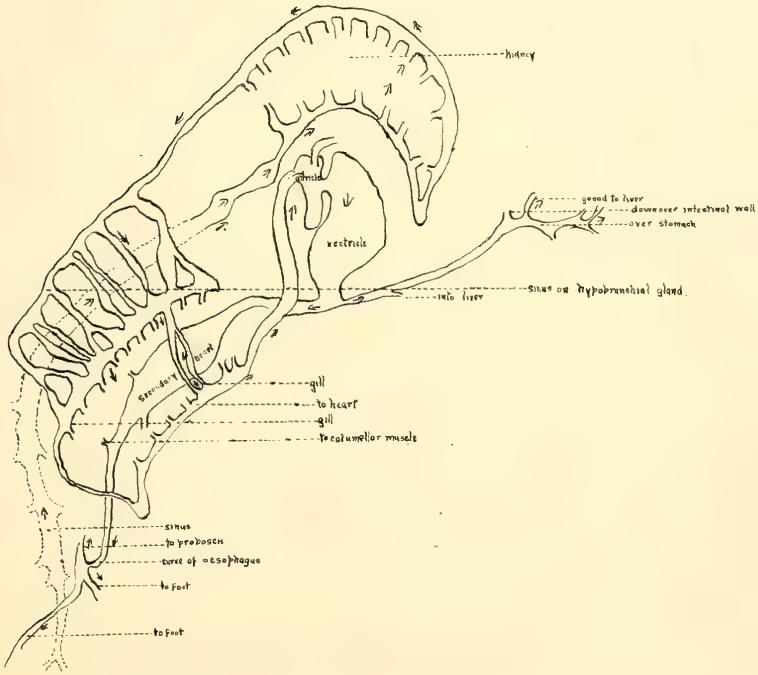


x section of Odontophore



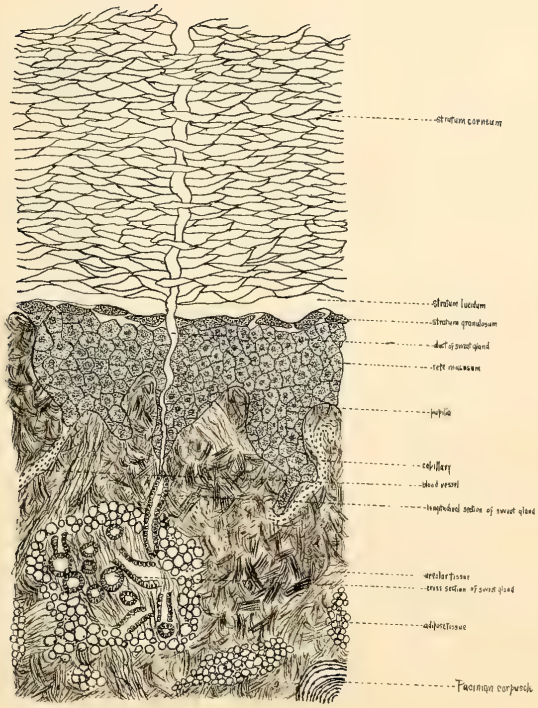
Mollusca Gastropoda Sycotopus

Circulatory System



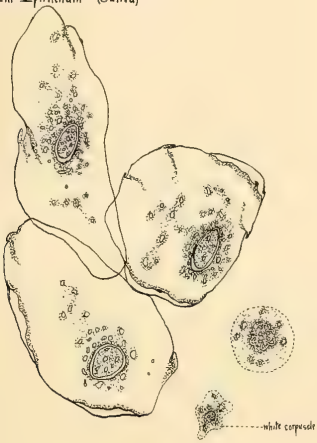
Paper Model of the Complex Gill of the Clam

Skin


stratum corneum
stratum lucidum
stratum granulosum
duct of sweat gland
rete mucosum
papilla
capillary
blood vessel
longitudinal section of sweat gland
areolar tissue
cross section of sweat gland
adipose tissue
Pacinian corpuscle

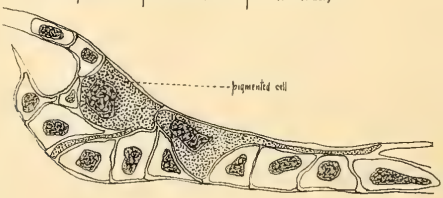
Epithelium

Pavement Epithelium (Saliva)

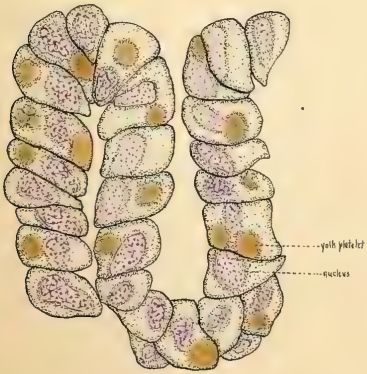


Stratified Epithelium (Skin)

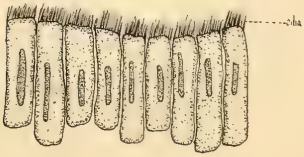
Pigmented Epithelium (Skin of Salamander)

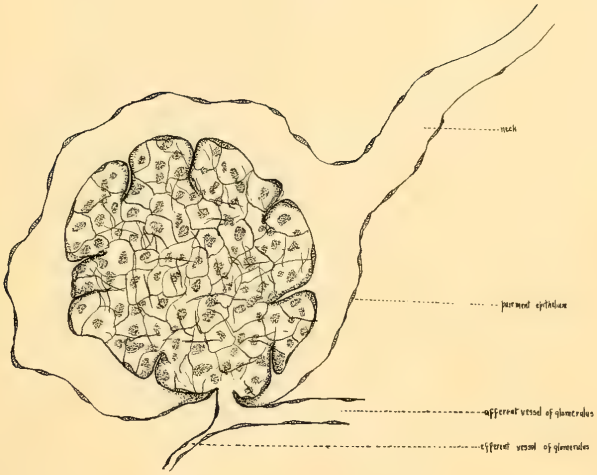


Simple Glandular Epithelium (Intestine)



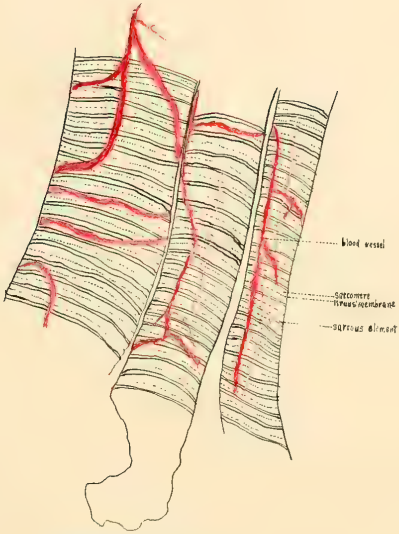
Ciliated Epithelium (Trachea of Cat)



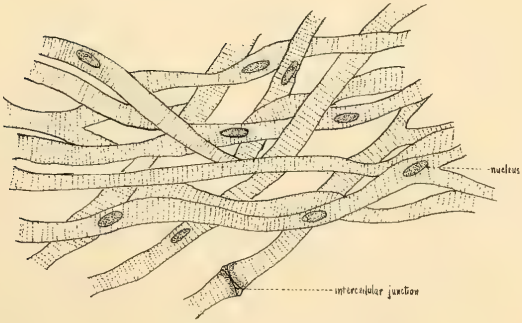


Malpighian Corpuscle from the Kidney

Muscle

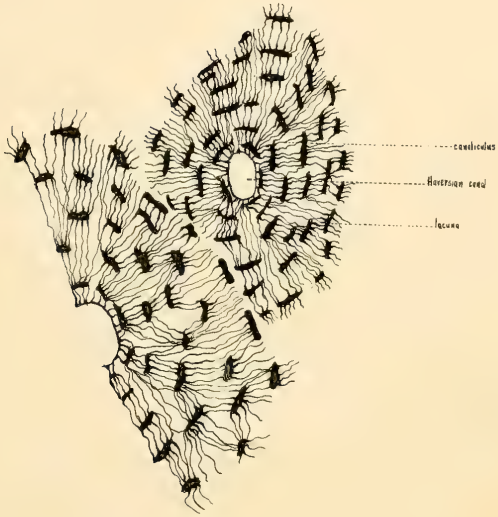


Capillary Vessels in Muscle

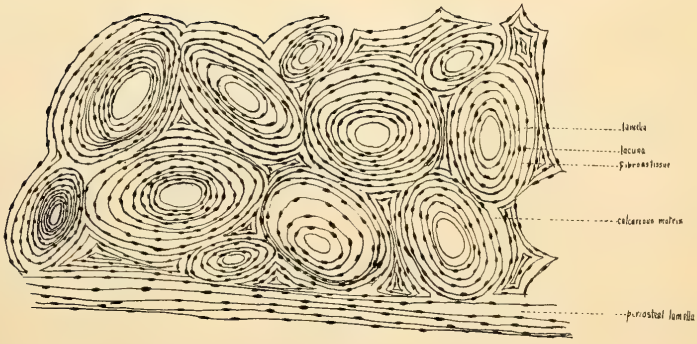


Cardiac Muscle Fibres

Connective Tissue
Bone



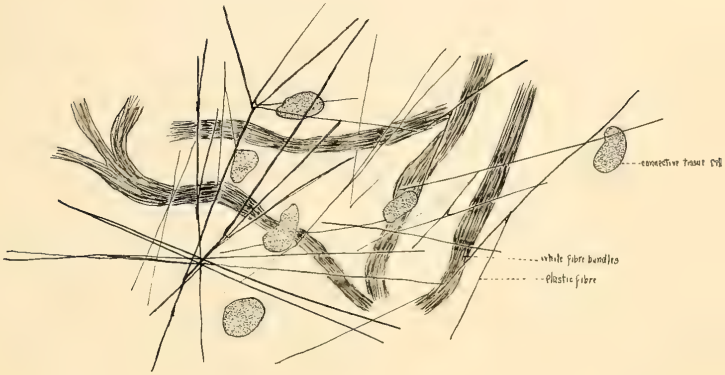
Transverse Section of Compact Bone



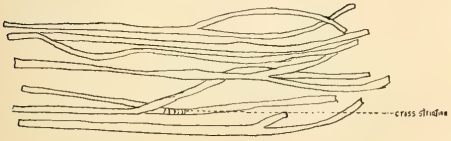
Section of A Decalcified Bone

Connective Tissues

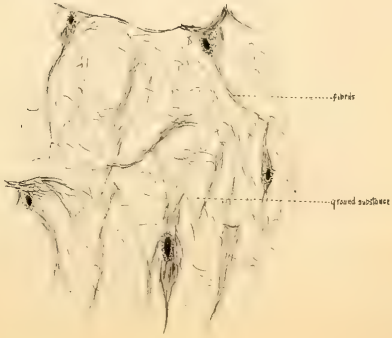
Areolar Tissue



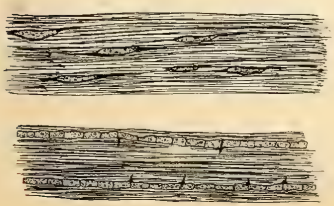
Ligamentum nuchae – Elastic Tissue



Umbilical Cord – Embryonic Tissue (Connective)

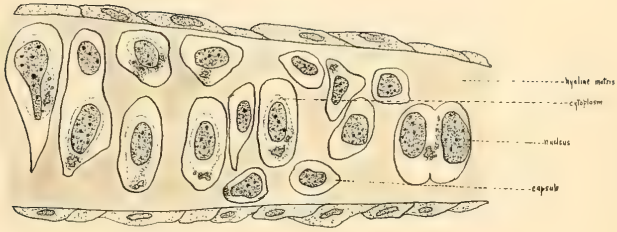


Tendon of Tail – White Fibres

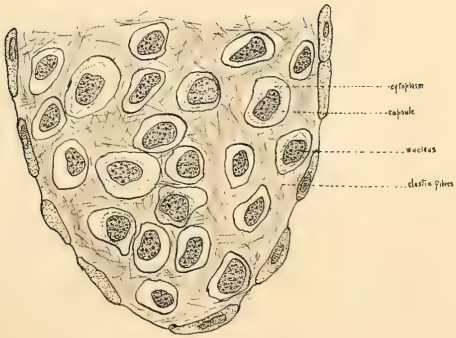


Connective Tissues

Cartilage



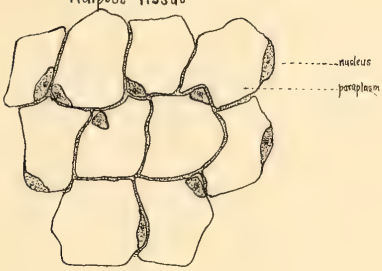
Bar of Cartilage



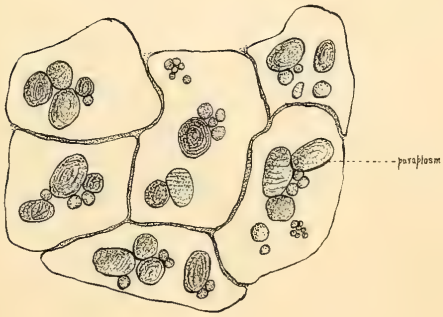
Elastic Fibro-Cartilage

Cell Inclusions

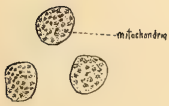
Adipose Tissue

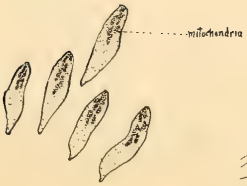


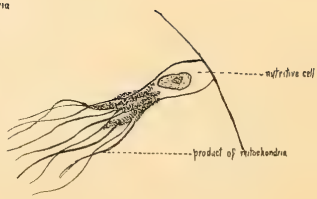
Potato

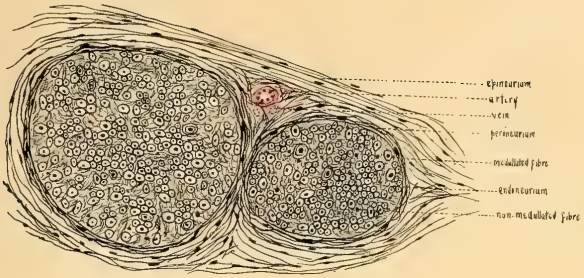


Testis

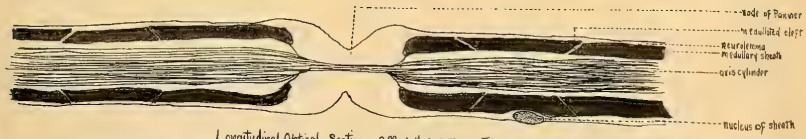




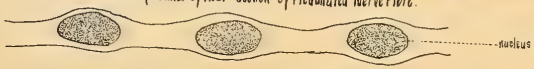




Cross Section of Two Funiculi

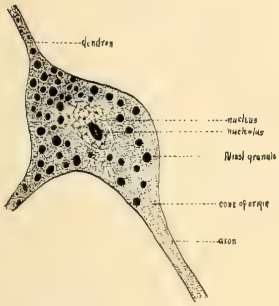


Longitudinal Optical Section of Medullated Nerve Fibre.

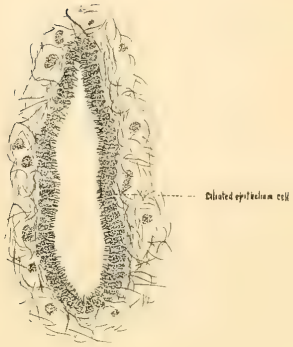


Non-Medullated Nerve Fibre.

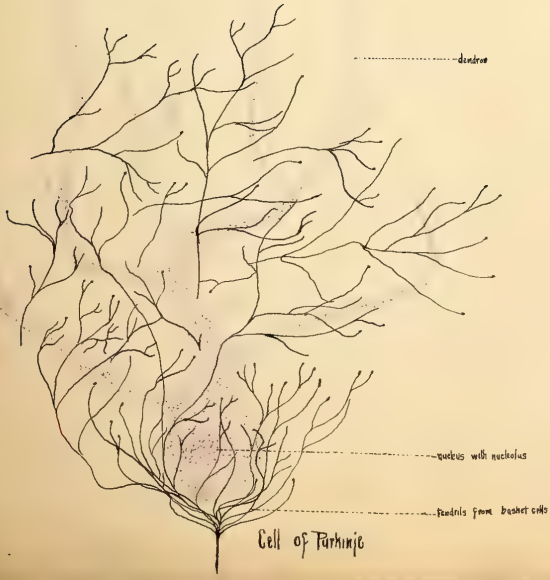
Nerve Cells



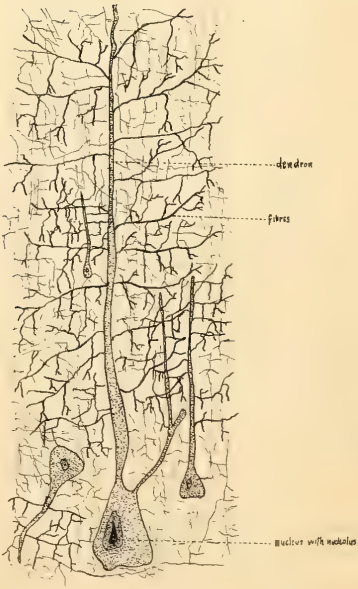
Multipolar Nerve



Canal of Spinal Cord of Child

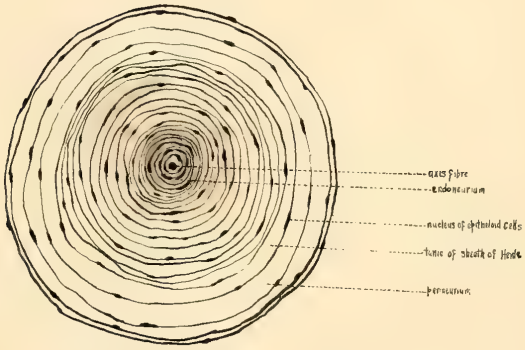


Cell of Purkinje

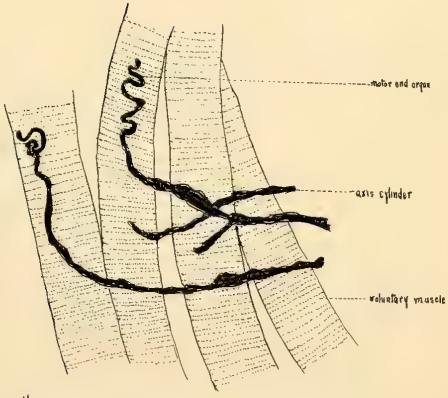


Pyramid Cells from Cerebral Cortex

Special Nerve Endings

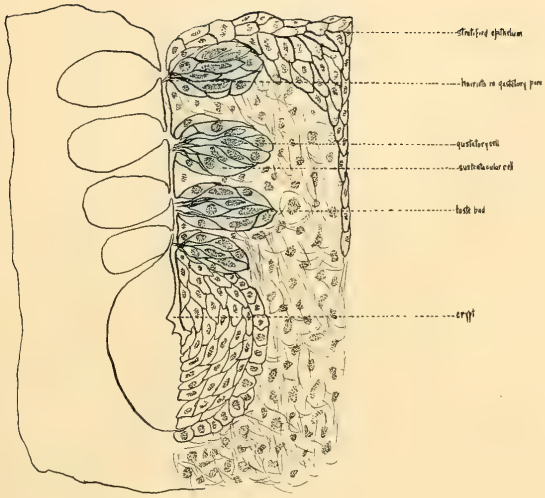


Cross Section of Pacinian Corpuscle

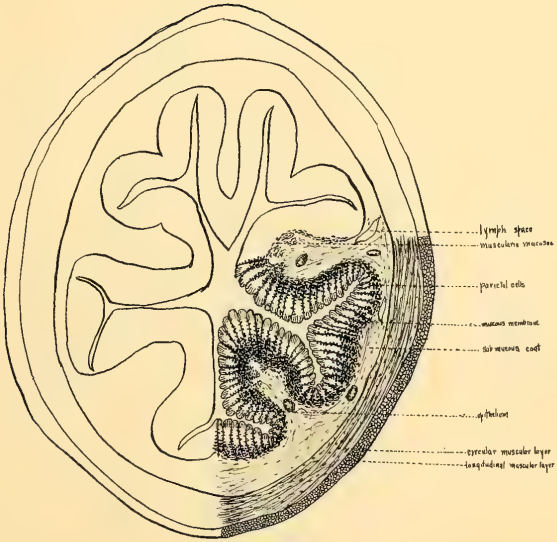


Human Motor Nerve Endings in Intercostal Muscle (Gold Chloride)

Tongue

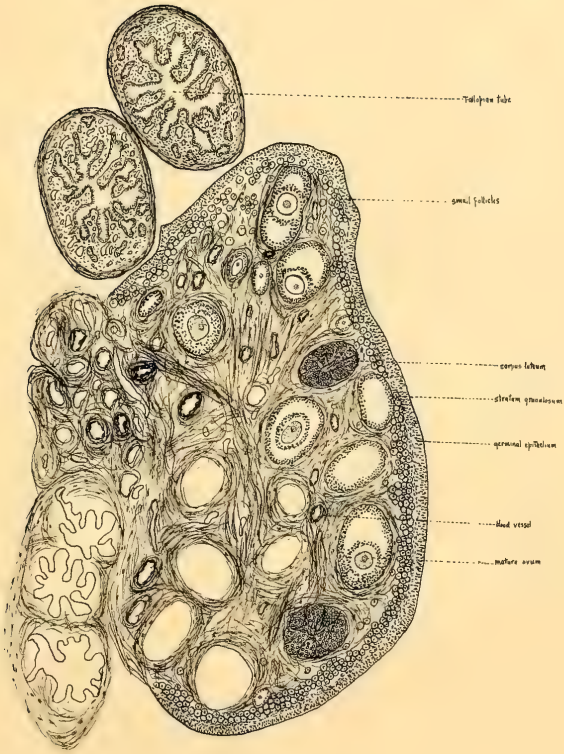


Section Through Papilla Foliata

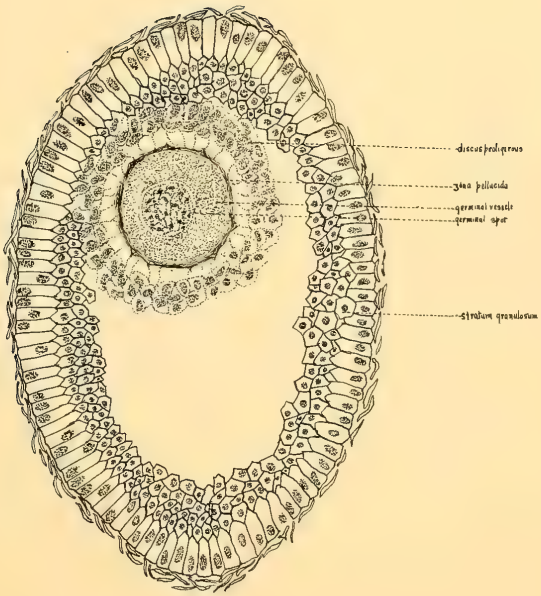


Cross Section of Stomach

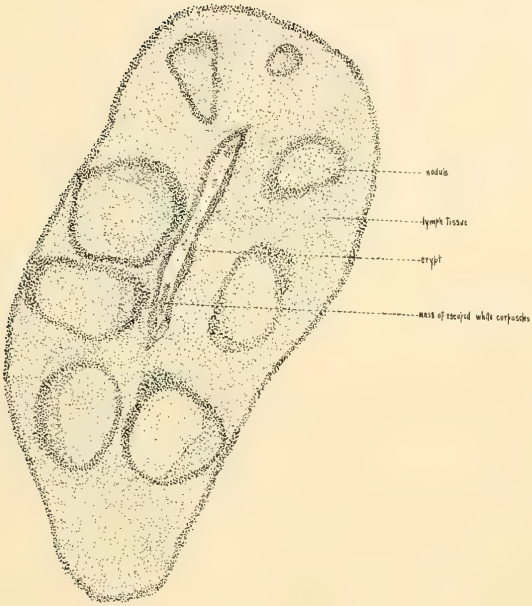
Ovary


Fallopian tube
small follicles
corpus luteum
stratum granulosum
germinal epithelium
blood vessel
mature ovum

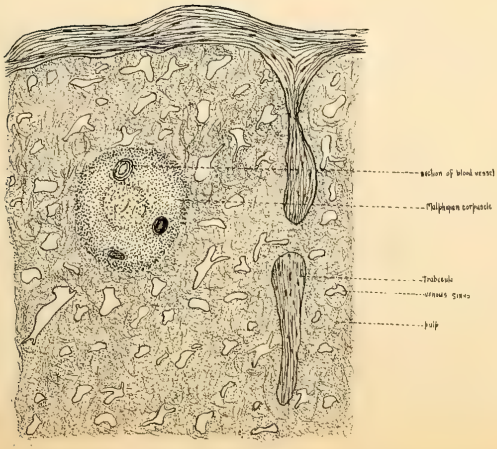
Ovum


discus proligerus
zona pellucida
germinal vesicle
germinal spot
stratum granulosum

Lymphoid Structures



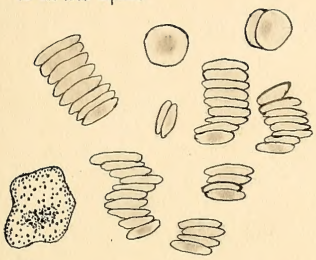
Tonsil



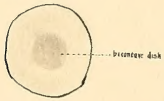
Section of Spleen

Human Blood

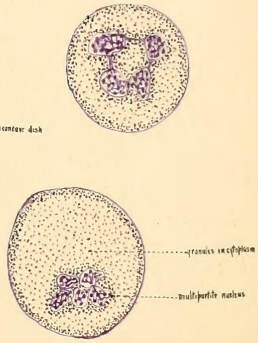
Red and White Corpuscles



Red Corpuscle

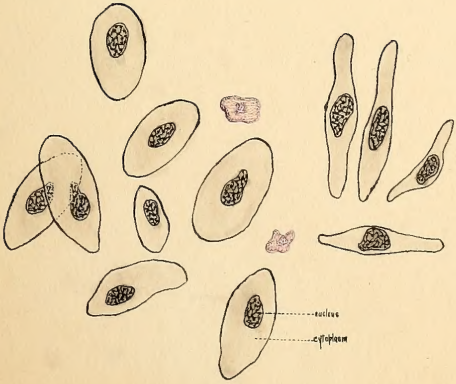


White Corpuscles

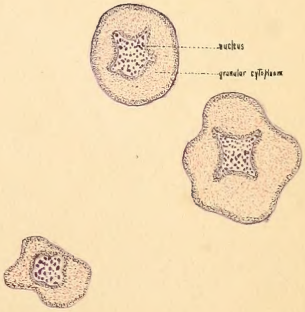


Amphibian Blood

Red and White Corpuscles



White Corpuscles



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